claim 2. Finally, to further reduce the issu s in this application, claims 37 and 38 ar cancelled without prejudice.

In the Office Action of 03/31/2003, the Examiner took the position that: "[t]he phrase 'substantially identical' recited in claim 1 is indefinite since it is not clear what is considered to be 'substantially' identical since no definite degree of identical is being stated here." In the final rejection the Examiner has taken a different position, namely: "[t]he feature concerning 'substantially identical' is very confusing since the applicant seems to argue that the reference beams are directed at different angles to the recording medium, if such is the case they cannot be identical to each other."

From the foregoing comment about "different angles," in the final rejection, it appears that the Examiner is confusing language in the specification and claims about "identical" (whether or not qualified by the words "substantially"), "path length" and "angles". The word "identical" has always been equated with the reference beams, not the specific path. As set forth in the Summary of the Invention ¶ [000033], *ll.* 5-6 (alternately, p. 9, *ll.* 6-7), Applicant's printer includes: "apparatus ... for dividing the reference beam into a plurality of identical reference beams each having its own path." The Summary of the Invention further elaborates, ¶ [000033], *ll.* 8-11 (alternately, p. 9, *ll.* 9-12):

> The object beam path and each of the reference beam paths, from the apparatus for dividing to the recording medium support, has the same length. Preferably, the apparatus for dividing includes a plurality of optical fibers, each of which addresses the recording medium support from a different angle.

The foregoing is repeated in ¶ [000050], *ll.* 4-9 (alternately, p. 14, *ll.* 4-9), namely:

> Fibers 71, 73 and 75 need to create identical reference beams, yet address the recording medium from different angles. Also, these optical reference beam path lengths, from beam splitter 19 to the plane of recording medium 45, must be the same as that of object beam 21. Splitter array 67 divides reference beam 23 into reference beams 231, 232 and 233, with equal intensities (+ 5% at 532 nm), lengths and beam diameters.

The foregoing differentiation is repeated elsewhere in the specification, noting: (1) ¶ [000050], *ll.* 15-16 (alternately, p. 14, *ll.* 15-16); (2) ¶ [000057], *ll.* 7-10 (alternately, p. 18, *ll.* 14-17); (3) ¶ [000065], *ll.* 21-

24 (alternately, p. 24, *ll.* 13-17); (4) ¶ [000066], *ll.* 12-14 (alternately, p. 25, *l.* 23 - p. 26, *l.* 2); and (5) ¶ [000067], *ll.* 24-26 (alternately, p. 27, *ll.*4-6).

The foregoing differentiation between "beam," "path length" and "path" is continued in the claims as filed and as amended.[1] What is meant by these words/phrases has never varied. Applicant has never made the argument, either directly or by inference, along the lines set forth at the very top of page 4 of the final rejection. Further, it is submitted that those ordinarily skilled in the art would clearly understand the distinctions and that "identical" (or "substantially identical") refers to the beam and not its path. The path length (from the beam splitter 19 to the recording medium) is the same; the paths of the reference beams are necessarily different.

While it is submitted that, based on the language set forth in the specification and claims (as filed), that the language in claim 1 (as thrice amended) is not vague or indefinite, Applicant has again amended claim 1 to delete reference to "identical" and substitute therefore the language with regard to path length as set forth in original dependent claim 3. The Examiner has never rejected claim 3 under § 112 based on any language recited in this claim.

For the reasons set forth above, the deletion of the language "substantially identical" obviates the rejection of claim 1 (as thrice amended) under § 112, second paragraph. The cancellation of claims 37 and 38 obviates the § 103 rejection to those claims. Accordingly, as the issues for appeal would be reduced and simplified, the Examiner is requested to enter this amendment at least for the purpose of reducing issues on appeal.

In addition to the foregoing, the Examiner is requested to reconsider the prior § 103 rejections. Claims 1 and 3 were rejected as unpatentable over Bencze, et al., in view of Klug, et al. While as to Bencze, et al., the rejection is based on the embodiment of Figure 5, the entire disclosure needs to be

[1] With the inadvertent exception to the amendment to the preamble of claim 37, which is cancelled without prejudice.

considered. As set forth in the Field of Invention, the "present inv ntion relates to a method of and apparatus for detecting errors in a photomask with respect to a standard photomask by subtraction technique." See col. 1, *ll.* 13-16. Similarly, the Summary of the Invention states:

> Our invention is based on recognition of the fact that holography, when combined with the subtraction technique, furnishes a very accurate means of error detection for inspecting photomasks.

To achieve the foregoing, the basic process first requires the recordation of what is referred to as a standard hologram 30 of standard photomask 15 (which is also referred to as the "master"). See col. 4, *ll.* 15-16. The process is described in reference to Figure 1. See col. 4, *l.* 15 - col. 5, *l.* 6. Thereafter, this finished standard hologram 30 is placed back in hologram plane 25. Photomask 28, the photomask to be inspected, is placed in the object plane (the plane previously occupied by master photomask 15). With this arrangement, the coherent light source, divided into a reference beam 24 and an analyzing beam 29, then generates a compound beam 27, 29 which is analyzed to determine how close photomask 28 is to the master mask.

> Hence, if the standard photomask 15 and the photomask 28 to be inspected are completely identical, the reconstructed standard beam 27 and the analyzing object beam 29 will completely cancel each other in the receiving plane 31. If, however, the inspected photomask 28 differs from the standard photomask 15 ... then the cancellation in the receiving plane 31 will not be perfect ... In this way, the defective and the flawless photomasks can be segregated by detecting the total radiation intensity present in receiving plane 31... .

Why and how this works is set forth in col. 5, l. 7- col. 6, l.24, in reference to Figures 2 and 3. Figure 2, in conjunction with col. 5, ll. 7-16, describes how "reconstructed standard beam 27" is generated and where it is in the optical system.

In the Office Action of 09/25/2003, p. 6, the Examiner made the following comment:

> The Bencze reference discloses the three reference beams each follows a beam path in the same manner as in the instant application as shown in Figures 1, 2, 6, and 9-12, namely each beam path has different angle orientation with respect to the recording medium and/or different path difference with respect to the recording medium. The plurality of reference beams taught by the

cited Bencze reference is th refore "identical" to each other in the same way as the plurality of referenced beams in the instant application.

As discussed above, Bencze et al. disclose a method and apparatus to determine the quality of photomasks used in the production of integrated circuits. In contrast, Applicant discloses a printer for producing white light viewable holograms. These different purposes require both different structure and different methodology. Applicant's printer cannot be used to compare a mask with a master mask. Conversely, the apparatus of Bencze et al. cannot produce white light viewable holograms.

One ordinarily skilled in holography would understand the different reference beams of Bencze et al. are stacked up in a horizontal plane, above the object beam. With reference to Figure 5 of Bencze, et al., the angle of incidence of the axis of each of the reference beams has to hologram plane 25 is different. In contrast, as is evident from (for instance) Applicant's Figure 9, the orientation of Applicant's reference beams is totally different. As one ordinarily skilled in the art would also appreciate from Applicant's disclosure, the reference beams (at the output ends 81, 83 and 85 of the optical fibers) are not, with reference to object beam 21, stacked in a horizontal plane. The distance from the point where the central axis of object beam 21 intersects the plane of film 45 to the each of out put ends 81, 83 and 85 is the same.

As is evident from Figure 5 of Bencze et al., the three reference beams are of different lengths, with 38 being the shortest and 44 being the longest. Thus, the distance from "beam splitter 5" (which would correspond to Applicant's "means for dividing said source into an object beam and a reference beam") to "hologram plane 25" (where "recording medium 26" is supported in both the object beam path and the reference beam path) is different for each reference beam. Clearly Bencze et al. does not disclose the limitation as set forth in subparagraph (e)(ii) that the reference beams all have the same path <u>length,</u> which is identical to the path <u>length</u> of the object beam. Further, there is no indication from Figure 5 of Bencze et al., or the associated text, that the object beam path (from "beam splitter 5" to "hologram plane 25") is the same as any of the three reference beams. In fact, the use of "controller 18" leads to a contrary

conclusion. As set forth in col. 5, *ll.* 58-61: "Th controller 18 adjusts the phase difference between the reconstructed standard beam 27 and the analyzing object beam 29 by varying the optical-path length of one of these beams, here the beam 27." Equal path lengths as disclosed and claimed by Applicant are required for printing white light viewable holograms. Bencze et al., is not interested in and cannot achieve this result, as they are comparing masks (used for manufacturing integrated circuits) with a master mask.

There is no basis on Bencze et al. to conclude that there is a "negligible difference between each path." Further, there is no basis in any of the references of record, or in physics, to support the position, taken on pp. 5-6 of the final rejection, that because of the "ultra fast of the speed of light ... the fast moving of the light between the paths will introduce negligible phase difference between the beams." A hologram is formed by the essential coherence of intersecting recording beams in order to form a uniform pattern. If the beams are not in step a hologram will not be formed. The speed of light has nothing to do with this.

There is no comparable structure or function in Klug et al., let alone any motivation in either reference to suggest any combination thereof.

While Applicant does not withdraw any previous argument made with regard to any of the secondary references and the dependent claims, for the sake of brevity they are not repeated in this Response.

Finally, the rejection under 35 U.S.C. § 112, first paragraph, should also be withdrawn as both the specification and drawings clearly support all the limitations set forth in claim 1, subsection (f). Please see ¶ [000060], *ll.* 7-8 and the upper left hand corner of Figure 9.

In view of the foregoing it is submitted that the claims are in condition for allowance.

Alternately, to simplify issues on appeal it is requested that the amendment be entered.

Respectfully submitted,

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I claim:

1. (Currently amended) A holographic printer comprising:

(a) a source of coherent light;

(b) means for dividing said source into an object beam and a reference beam, said object beam having a beam path, said reference beam having at least one beam path;

~~(c) means, positioned along said object beam path, for positioning an image in said object beam path;~~

(d) means for supporting a recording medium in both said object beam path and said reference beam path;

(e) means, positioned along said reference beam path between said source dividing means and said recording medium support, for dividing said reference beam into at least three ~~substantially identical~~ reference beams, each having its own path, wherein,

i. said object beam path, from said source dividing means to said recording medium support, has a given length,

ii. each of said reference beam paths, from said source divided means to said recording medium support has said given length; and

iii. each of said reference beam paths intersects said object beam path at said recording medium support; and

(f) a plurality of shutter means, said plurality of shutter means including a shutter means positioned in said object beam path between said source dividing means and said recording medium support, said plurality of shutter means also including a shutter means for each of said at least three reference beams.

2. (Previously Amended) The printer of claim 1, wherein said reference beam dividing means includes a plurality of optical fibers.

3.. [canceled].

4. (Currently amended) The printer of claim 2~~3~~, wherein each of said plurality of fibers addresses said recording medium support from different angles.

5. (Original) The printer of claim 2, further including a fused optical fiber and means for dividing said fused optical fiber into said plurality of optical fibers.

6. (Original) The printer of claim 5, wherein said means for dividing is a polarization maintaining splitter array.

7. (Original) The printer of claim 2, wherein each of said plurality of fibers has an output end, each of said output ends being equally spaced from said recording medium support.

8. (Original) The printer of claim 7, further including means for supporting each of said output ends of said plurality of fibers.

9. (Original) The printer of claim 8, wherein each of said fiber support means includes means for holding said output end, means for adjusting the angular orientation of

said output end relative to said recording medium support, and means for adjusting the distance between said output end and said recording medium support.

10. [canceled].

11. [canceled].

12. (Previously Amended) The printer of claim 15, wherein said plurality of shutter means are solid state means.

13. [canceled].

14. [canceled].

15. (Previously amended) The printer of claim 1, further including shutter control means for controlling each of said plurality of shutter means, said shutter control means including means for sequentially opening each of said reference beam shutter means, said shutter control means also including means for opening said object beam shutter each time one of said reference beam shutter means is opened.

16. (Original) The printer of claim 15, wherein said plurality of shutter means are non-mechanical.

17. (Original) The printer of claim 1, wherein said means for positioning an image includes means for holding a transparency.

18. (Original) The printer of claim 1, wherein said means for positioning an image is a liquid crystal panel.

19. (Original) The printer of claim 18, further including means for suppling images to said liquid crystal panel.

20. (Original) The printer of claim 19, wherein said means for supplying images includes computer means.

21. [canceled].

22. [canceled].

23. [withdrawn]

24. [withdrawn]

25. (Previously amended) The printer of claim 1, wherein each of said at least three reference beams includes means for beam manipulation.

26. (Previously amended) The printer of claim 25, wherein each of said means for beam manipulation includes a cylindrical lens.

27. [withdrawn]

28. [withdrawn

29. [withdrawn]

30. [withdrawn]

31. [withdrawn]

32. [withdrawn]

33. [withdrawn]

34. [withdrawn]

35. [withdrawn]

36. [canceled].

37. [canceled.]

38. [canceled].

I claim:

1. A holographic printer comprising:

(a) a source of coherent light;

(b) means for dividing said source into an object beam and a reference beam, said object beam having a beam path, said reference beam having at least one beam path;

(c) means, positioned along said object beam path, for positioning an image in said object beam path;

(d) means for supporting a recording medium in both said object beam path and said reference beam path;

(e) means, positioned along said reference beam path between said source dividing means and said recording medium support, for dividing said reference beam into at least three reference beams, each having its own path, wherein,

i. said object beam path, from said source dividing means to said recording medium support, has a given length,

ii. each of said reference beam paths, from said source divided means to said recording medium support has said given length; and

iii. each of said reference beam paths intersects said object beam path at said recording medium support; and

(f) a plurality of shutter means, said plurality of shutter means including a shutter means positioned in said object beam path between said source dividing means and said recording medium support, said plurality of shutter means also including a shutter means for each of said at least three reference beams.

2. The printer of claim 1, wherein said reference beam dividing means includes a plurality of optical fibers.

3. [canceled].

4. The printer of claim 2, wherein each of said plurality of fibers addresses said recording medium support from different angles.

5. The printer of claim 2, further including a fused optical fiber and means for dividing said fused optical fiber into said plurality of optical fibers.

6. The printer of claim 5, wherein said means for dividing is a polarization maintaining splitter array.

7. The printer of claim 2, wherein each of said plurality of fibers has an output end, each of said output ends being equally spaced from said recording medium support.

8. The printer of claim 7, further including means for supporting each of said output ends of said plurality of fibers.

9. The printer of claim 8, wherein each of said fiber support means includes means for holding said output end, means for adjusting the angular orientation of said

output end relative to said recording medium support, and means for adjusting the distance between said output end and said recording medium support.

10. [canceled].

11. [canceled].

12. The printer of claim 15, wherein said plurality of shutter means are solid state means.

13. [canceled].

14. [canceled].

15. The printer of claim 1, further including shutter control means for controlling each of said plurality of shutter means, said shutter control means including means for sequentially opening each of said reference beam shutter means, said shutter control means also including means for opening said object beam shutter each time one of said reference beam shutter means is opened.

16. The printer of claim 15, wherein said plurality of shutter means are non-mechanical.

17. The printer of claim 1, wherein said means for positioning an image includes means for holding a transparency.

18. The printer of claim 1, wherein said means for positioning an image is a liquid crystal panel.

19. The printer of claim 18, further including means for suppling images to said liquid crystal panel.

20. The printer of claim 19, wherein said means for supplying images includes computer means.

21. [canceled].

22. [canceled].

23. [withdrawn]

24. [withdrawn]

25. The printer of claim 1, wherein each of said at least three reference beams includes means for beam manipulation.

26. The printer of claim 25, wherein each of said means for beam manipulation includes a cylindrical lens.

27. [withdrawn]

28. [withdrawn

29. [withdrawn]

30. [withdrawn]

31. [withdrawn]

32. [withdrawn]

33. [withdrawn]

34. [withdrawn]

35. [withdrawn]

36. [canceled].

37. [canceled.]

38. [canceled].